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Sperm transport in humans

Background

The capacity of the human female reproductive tract to establish sperm reservoirs and the mechanisms controlling this have not been investigated. This is probably due to two factors. Firstly, studies on human sperm transport are fraught with ethical and logistic problems and, second, the concentration of research on assisted conception and the subsequent ability to achieve fertilization in vitro has undoubtedly detracted from the importance of sperm transport in vivo.

Sperm transport in the cervix

There have been a number of extensive studies on the interaction between sperm and human cervical mucus, an interaction which is highly complex. Sperm penetration is dependent not only on factors such as sperm concentration, motility and morpnology .) but also on the capacitational status of sperm seminal enzymes and antisperm antibodies . Interestingly, in-vitro studies of sperm mucus penetration have shown that wemovement characteristics account for 85% of the variability in penetration , with the concentration of motile sperm and linear velocity of progression being the two most important functions determining the number of sperm penetrating per unit time Many morphologically abnormal sperm are excluded from penetration of cer-vical mucus which is probably due to the associated abnormality in flagellar activity The latter authors have studied specifically the relationship between sperm morphology and motility in both semen and cervical mucus.Abnormal sperm swam more slowly in mucus than did normal sperm,

and the heads of abnormal sperm experienced greater resistance from mucus than did those of normal sperm. Such studies emphasize the interrelationships betweendifferent functional aspects of the sperm. As such techniques can be adapted to investigate sperm movement in other regions of the tract (e.g. cumulus) they will act as a starting point for further investigations. Although we know that sperm loss in the vagina is probably high in humans and animals , we do not know the proportion of ejaculated sperm which enter cervical mucus in vivo. Data from in-vitro studies in which a column of cervical mucus is placed directly into semen suggest that this is very variable, ranging from 3-46% in men with normal sperm counts (Katz et af., 1980). It is difficult to extrapolate these data to the in-vivo situation, but simple in-vivo calculations comparing sperm numbers in the ejaculate and those recovered from cervical mucus suggest a ratio of 1:2000 sperm enter the cervical mucus (0.05%: Settlage et al., 1973). Undoubtedly manyfactors will affect the passage of sperm into cervical mucus (e.g. hormonal status:), but this information is necessary if we are to begin to addres confidently such questions as sperm wastage along the female tract. Bearing in mind the known enormous inter- and intra-individual variation in sperm counts in men, this factor also needs to be accounted for when designing experi